

Task 1: Proactive Audit Approach to Support SMS in Airline Maintenance and Ramp Operations (LOSA; Gildea)

Program Manager:

Glen Gallaway, AJP-61, (202) 267-3173

Task Stakeholders/Sponsors

John J. Hiles, Aviation Safety Inspector / Human Factors National, AFS-330, 202-385-6421

Dr. Bill Johnson, CSTA Human Factors Maintenance, AIR-100, 770-458-7921

Performing Organization:

Kevin Gildea, Ph.D., AAM-510, 405-954-7481, kevin.gildea@faa.gov

University/Contract Performing Organization:

Center of Aviation Safety Research Agreement Saint Louis University

Jiao (Maggie) Ma, (314) 359 5090, jma3@slu.edu

Xyant Technology

Daniel Jack, (405) 954-6836, daniel.ctr.jack@faa.gov

Contract The LOSA Collaborative

James Klinect, 512-892-5527, klinect@losacollaborative.org

Project Start Date: 8/1/2008

Anticipated End Date: 9/30/2011

Requirements Statement	
Operational Shortfall or Knowledge Gap	Background: The aviation industry is maturing in its preference for proactive intervention in potentially hazardous circumstances. Proactive approaches, as opposed to post accident/event investigation, are aligned with the principles of risk management and Safety Management Systems. There is a need to study various maintenance and ramp operations during normal and eventful situations. Such auditing has the potential to evaluate organization (including its systems, processes, and personnel), ascertain the validity and reliability of its information, and consequently assess its internal control.
Benefit in Closing the Shortfall or Gap	Systems like the Maintenance Aviation Safety Action Program (MASAP) are proactive in that they help forecast pitfalls but the basis of the predictions depends upon previous adverse events. Formalized observations of normal operations, as demonstrated by Line Operations Safety Audits (LOSA) on the flight deck, have high potential for both maintenance as well as ramp operations.
Description of the Desired Product	Capitalize on past research results and active industry partnership (both management and labor) and not expend extensive resources redefining maintenance error. Identify external and internal threats and seek a thorough understanding of specific knowledge and cognitive skills required for threat and error management in their line operations. Use a data-driven approach to evaluate allocation of resources and understand technicians' shortcuts and workarounds. Build and deliver training systems for auditors and for all management and staff to measure the impact of the audit programs.
Schedule	Monthly and Annual Reports Provide short-term results for topics identified that require immediate attention including prototype LOSA systems

Research Objective

Identify external and internal threats in maintenance and ramp normal operations. Derive forms and a database for airlines and maintenance companies to use to support a data-driven approach to evaluate allocation of resources and understand technicians' shortcuts and workarounds.

Background

Systems like NASA's Aviation Safety Reporting System (ASRS) and FAA's Maintenance Aviation Safety Action Program (MASAP) focus on encouraging air carrier and repair station employees to voluntarily report safety information. The ASAP program provides an important, previously unavailable source of data, that are captured rapidly and directly from those responsible for the day-to-day safe operation and maintenance. Self-report data are a good means to provide the crewmember perspective crucial to interpreting aircraft state and crew behavior during incidents (Jones & Tesmer, 2006).

Maintenance organizations require increasing support on the development, application, and evaluation of auditing systems to enhance their new and evolving safety management systems. The extensive research, development, application, and evaluation of LOSA in flight operations have direct applicability to maintenance. Successful application of ASRS and ASAP demonstrate the willingness to adopt features of a proactive system like LOSA. There are currently active evolving maintenance and ramp operations LOSA programs, in some US carriers, that can serve as a basis for this research.

Previous Activity on this Task

LOSA has been implemented successfully in Flight Deck operations. Maintenance safety audits are intended to complement other safety-data sources such as ASRS and ASAP by tapping different feedback mechanisms. They are the foundation of identifying the contributing factors leading to errors, injuries, events, or accidents.

These data are also critical to sustaining a functional Safety Management System (SMS). SMS, including the necessary organizational structures, accountabilities, policies and procedures, has two "core" components: safety assurance and safety risk management (Broderick, 2008). Serving as the core of a company's variety of safety efforts, SMS provides an organizational framework to support a sound safety culture (FAA, 2006). Assisted by safety audits of normal operations, SMS will also provide significant business benefits such as better operational process management and consequently financial benefits. This project will apply LOSA to the requirements of maintenance and ramp environments. From the very start, researchers will capitalize on activity with industry partners already working on LOSA for maintenance and ramp operations.

In FY09, the LOSA team initiated a Cooperative Agreement and a contract to assist with the project. In the third quarter the team delivered a draft literature review that (1) summarized the successes and challenges the LOSA program in flight operations (2) identified and compiled the knowledge that transferred to the maintenance environment, considering the differences between flight operations, maintenance and ramp operations. During the year, the team designed and built prototype audit tools and data entry/analyses software. The team attended several workgroup meetings as well as maintenance and ramp beta test for the forms with industry personnel.

Proposed or Planned Research

This study shall identify precursors to maintenance or ramp event(s) during normal operations. The project shall continue to develop forms to create structured collection methods conducive to timely analysis. A premise of the research shall be that an evolving structured collection of the right data ensures rapid response and useful data. The project shall adopt field studies, analysis of multiple incidents (as was done to develop the HFACS taxonomy) to evaluate precursors and propose remediation. The study shall rely on industry partner cooperation for field observations and information/documentation audits.

The safety audit will help maintenance organizations capitalize on past research results, encourage active industry partnership (both management and labor) while not expending extensive resources redefining maintenance error. Maintenance and ramp organizations will be able to identify external and internal threats and

develop an understanding of specific knowledge and cognitive skills required for threat and error management in their operations. This project will deliver LOSA forms for audits, analytical tools, and training material.

Research Question(s)

- What is needed to develop LOSA checklists and observations forms to identify human factors issues (i.e., hazards, threats) that are precursors to maintenance events?
- What is needed to develop LOSA checklists and observations forms to identify human factors issues that are precursors to ramp events?
- How can the data gathered from the respective LOSA observations be analyzed to identify trends and to evidence successful interventions?
- What interventions must be introduced to mitigate the identified threats?

Technical Approach

Current Year

In the second year, research will focus on refining and fielding the data collect and analysis tools developed in FY09. The research team will also apply foundations of human factors to help ensure that the normal operations data collection are collecting the “right” information and are able to form reasonable conclusions. The team will also help identify, establish, and test mitigations to address issues identified in the process.

The team will focus on an applied approach that capitalizes on existing success with LOSA. The team will create the tools to empower the industry. The team will focus on tools and procedures that ensure that this project builds on the successes of the first year and provides an exit strategy. The project will deliver ready-to-use tools, provide training documents, and processes to assess project safety and financial value for airline maintenance and ramp operations.

CAMI will continue to work with support personnel including contractors and cooperative agreement personnel to complete the project. The cooperative agreement personnel have demonstrated practical experience and provided publications related to maintenance event reporting systems.

Out-Years

As the task evolves through 2011 the project will create and support data processes and tools and cooperate to help industry establish programs and analyze data. This will include adding additional airlines and maintenance repair organizations. CAMI and support personnel will help develop a standardized LOSA approach for maintenance and ramp operations. CAMI and support personnel will develop a structured database that captures LOSA data points for airline personnel to use and maintain. Additionally, the team will assist with needed analyses to develop baseline output to compare future trends.

Air Traffic Resources Required

None

Information Technology Resources Required

Coordinate acquisition of software needs of programmer with AAM-500 Information Technology personnel: Rick a new computer, CAMTASIA, visual studio

Calibration

None

FY10 Milestone Schedule		
Description	Proposed Start Date	Proposed Completion Date
Final version literature review	FY09 Q1	FY10 Q3
Deliver audit tools and data entry/analyses software	FY09 Q2	FY10 Q4
Deliver audit metrics for field observation and information audit in conjunction with industry partners	FY09 Q2	FY10 Q3
With airline personnel assistance, design and prototype training for field observers and for employees being audited	FY09 Q3	FY10 Q3
Brief US Air Transport Association Maintenance and Ramp Human Factors Committee on progress	FY09 Q3	FY10 Q4
Deliver standard LOSA data collection forms and techniques that can be used by industry personnel	FY09 Q4	FY10 Q4
Airline personnel conduct LOSA implementations at a minimum of 3 sites with not less than 10 audits per site, using prototype tools and training	FY10 Q1	FY10 Q4

FY10 Deliverables		
Description	Proposed completion date	Actual completion date
Brief US Air Transport Association Maintenance and Ramp Human Factors Committee on progress	FY10 Q4	
With airline personnel assistance, design and prototype training for field observers and for employees being audited	FY10 Q3	
Deliver standard LOSA data collection forms and techniques that can be used by industry personnel.	FY10 Q4	
Draft summary of literature review to (1) summarize the successes and challenges the LOSA program in flight operations (2) identify and compile the knowledge base that can be readily transferred to the maintenance environment, considering the differences between flight operations and aviation maintenance (including ramp operations).	FY09 Q3	FY09 Q3
Final version literature review	FY10 Q3	
Airline personnel conduct LOSA implementations at a minimum of 3 sites with not less than 10 audits per site, using prototype tools and training	FY10 Q4	